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As this issue of *The Beat* is published, I am about six months into the position of Chairman of the Division of Cardiology. It seems a fitting time and place to express my sincere gratitude to Pauley Heart Center's faculty and staff for their support and patience during this time of transition. Such able assistance while I get up to speed has been, and will continue to be, invaluable.

As you can imagine, "getting up to speed" takes on new meaning with the pace set by my friend, colleague and Chair-predecessor, Dr. George Vetrovec. George's work ethic is legend and matched only by his dedication to his patients. Combined with his intellect, skill and accomplishments, he has transformed the Pauley Heart Center into one of the top cardiovascular centers in the world. That's a hard act to follow, but fortunately, his cath lab is right down the hall, so his advice and wise counsel is readily accessible.

Thanks to our exceptional faculty, there is much to report in this issue of *The Beat*.

It is a real pleasure to see my long time friend and colleague, Dr. Mark Wood, on the cover, and to read his interview. I have worked with Mark for almost 20 years and will attest to the fact that he is the consummate academic physician. His impact on the field of electrophysiology is immeasurable, in terms of the young people he has taught, the patients he has cared for and the knowledge he has generated and shared. The book he co-authored with Dr. Shoei Huang, *Catheter Ablation of Cardiac Arrhythmias*, is now in its second edition and is considered the seminal text on cardiac catheter ablation worldwide.

Innovation in cardiovascular treatment has long been a hallmark of our heart center. Our patient population expects, and we demand, no less. Nowhere is this more evident than in Dr. Michael Cowley's story about the introduction and development of balloon angioplasty. He knows of what he speaks; he has lived it.

Our record of pioneering advances in cardiothoracic surgery is equally impressive with heart transplantation, total artificial heart and implantable device programs heading the list. We are on track for a record year of heart transplants, with 13 performed here and at the V.A. to date. Dr. Derek Brinster, featured on pages 4 – 5, is building on our tradition of CT innovation in a Thoracic Aortic Surgery program that is bringing the latest, state-of-the-art medical and surgical approaches to aortic disease patients.

Strategic hiring over the past few years is paying off in myriad ways, not the least of which is the energy and vitality that young people bring to our programs. Dr. Fadi Salloum and Dr. Antonio Abbate are a case in point. To have two young investigators receive major grants from the AHA within the same funding cycle is extraordinary. We are very proud of their achievements.

Hardly a week goes by without receiving cards and letters from patients and families eager to express their appreciation for the care they received at Pauley Heart Center. Their stories, two of which are included in this issue, are a tremendous source of inspiration, strengthening our resolve to always provide the best possible patient care. I hope you will enjoy them and look forward to patient success stories as a regular feature in *The Beat*.

These are exciting times at Pauley Heart Center. Challenges surely lie ahead, but with our dedicated faculty and staff, and the trust and support of our loyal friends, we will continue to lead the way in cardiovascular care, research and training.

Sincerely,

Kenneth A. Ellenbogen, MD
Chairman, Division of Cardiology

VCU Pauley Heart Center

The Beat

A Publication of the VCU Pauley Heart Center on Virginia Commonwealth University's Medical College of Virginia Campus

Mark A. Wood, MD is Professor of Internal Medicine, Cardiology, and serves as Assistant Director of the Cardiac Electrophysiology Laboratories. He is recognized internationally as an exemplar of the academic physician: dedicated clinician, conscientious scholar, meticulous investigator and insightful educator. Recently, we asked Dr. Wood to share his perspectives on the benefits and challenges of a career in academic medicine and to tell us about the experiences that have been most meaningful to him. Please turn the page for a transcript of our interview.

Faculty Interview: Mark S. Wood, MD

Teacher, Mentor, Scholar, Researcher, Clinician

Let's begin at the beginning. Why did you choose a career in academic medicine?

I enjoyed the teaching aspects, as well as the research opportunities. Also, it puts you on the leading edge of technologies, techniques and practices in clinical work.

My parents were both educators and my father taught physiology at the medical school in Memphis. I visited his laboratory and we did experiments. When he talked about medicine it was always the academic kind of medicine, so it was a very natural career choice for me.

Did you have any mentors that were particularly influential, and if so in what ways?

I had a lot of encouragement and guidance, but Mike Hess and Ken Ellenbogen especially stand out. As a cardiology fellow I worked with Ken at the V.A. doing clinical electrophysiology research and I found that it thoroughly fascinating. And Mike Hess gave me a research opportunity in his laboratory very early on and that really sparked my interest in research. Actually, I enjoyed the whole training process. Everyday you come in and you are learning so much and growing so much. Those were some of the best academic years of my life, training in electrophysiology here and at UVA with John DiMarco and David Haines.

According to your colleagues, you do it all well: clinician, researcher, scholar and educator. Which of these roles do you enjoy the most and why?

To me, it is all one thing, all intertwined. I have found that if, for whatever reason, my energies are shifted towards any one aspect to a great extent, then I miss the others.

What are the major challenges involved in managing a career with so many forces that are vying for your time?

It is getting increasingly difficult, as there is more pressure for clinical productivity. But if you are teaching fellows and other physicians-in-training, you can't rush that and still have them pick up anything meaningful in the process. So it is a matter of trying to be as efficient as possible when you are with the fellows, and encouraging them to be efficient in their procedures and clinical work. And then doing the same yourself in order to leave time for teaching, research, and writing or editing publications.

What are the major benefits of having this broad spectrum of roles?

For me it's the learning experience. I think of it as almost selfish in a lot of ways, I gain so much. In your interaction with fellows and housestaff, they are asking questions and in order to explain things to them you really have to have a thorough understanding of the topic. It is the same with teaching and doing the research. You gain so much from doing the background reading and research on a topic you are going to speak about or an investigation you are going to pursue.

Tell me about your research interests. Have you always focused on one area of research or has your interest and focus changed over time?

It is always been electrophysiology. Even in general cardiology training my main interest was really the electrophysiology aspects of it. Reading EKGs—that's the first exposure you have—and being able to look at that set of squiggly lines and make observations and deductions about what is happening on a physiologic basis fascinated me from the onset.

My research projects have varied over time, at first looking at drug mechanisms, then at some physiologic responses to pacing, and recently, working with newer ablation modalities such as cryoablation. The projects usually evolve from problems and things that I see in the clinical laboratory, things that pose questions, like why doesn't this work, or what is this that I am seeing.

Again, it is all connected, all ties together. The research is bound up in the clinical part, and in the research lab I have employed medical and grad students, and even high school students interested in learning research techniques, so there is the teaching aspect.

You are the recipient of numerous teaching awards, from medical students as well as cardiology fellows. What does it take to be a great teacher? What do you get out of teaching?

To be a good instructor, you have to fully understand the topic, of course. But maybe even more important, you have to know who you're talking to and their level of knowledge of the topic. For example, when you are talking to med students it is all so new to them. Maybe the first time they ever saw an EKG was two days ago, and now we are going to cover two dozen different heart rhythm abnormalities that they are supposed to be able to diagnose by looking at the heart tracing. So you have to be connected to what their understanding is and not go over their heads with it. You must make the topic relevant to them in some way so they are interested in learning about it.

Then when you are teaching the cardiology fellows, they are more advanced but still you need to introduce some more techniques and there is a lot to take in. For the EP fellows, they ultimately need to hear everything you know. But it has to be doled out as they are ready for it so that they can absorb a reasonable amount at a time. You have to help them build and keep building over a two-year period. You should teach in a way that the student can make logical extrapolations from and extend what they are shown. They should be left with the desire to apply their new knowledge. Now, what do I get out of teaching? You keep learning and it keeps you sharp. You get these questions coming from seemingly odd angles, not so constrained by the dogma of the field. You think, well maybe that's not so crazy after all; let's talk about it. It forces you to stay fresh, to be open to new ideas and viewpoints.

What advice would you give to a young doctor about deciding whether to go into private practice or academic medicine?

The field really needs good, bright people, but unless a person is deeply interested in teaching and research, it is unlikely that he or she will be happy in academic medicine. There are certain benefits and challenges to working within an institutional academic system. Academic medicine has to fit your personality. It is for people that like to question, to mull things over, and to think about them on a deeper plane.

And finally, would you like to tell about a rewarding experience, a career highlight that shines exceptionally bright?

I think it would be my China experience. In 1991, I had just finished my fellowship and the whole field of cardiac ablation was only about 2 years old at that point. I was offered the opportunity to travel to Beijing to help Dr. Dayi Hu get an ablation program started at his hospital, Chao Yang Red Cross Hospital.

So I was just months out of my fellowship and was off to China. I remember reading and studying so hard, and making little note cards to have in my pocket because if there was something I didn't know, there wasn't going to be anyone in the whole country to ask. And they didn't have any equipment, which meant that I had to take everything with me—wires and catheters and sheaths and even the ablation generator that you use.

I started with a series of lectures in the cafeteria of the hospital, and then for the next week we did procedures. Our laboratory was in what appeared to be a converted library. There were wood paneled walls and gold sconces. It was just unbelievable. And the equipment was pretty dated. The IV bottles were all glass and when they needed to replace the IVs they'd take the top off and would pour more in this thing and keep running it into the patient.

Anyway, it went remarkably well. I went back for several years, and the program continued to grow. In 1994 I was made honorary professor of the Chao Yang Hospital. That meeting that started off in a small hospital cafeteria with just a few cardiologists and technicians now fills the Beijing Convention Center with over 6,000 attendants from several continents.

Dr. Hu went on to develop a program that reached hospitals throughout China, ultimately training over 200 hospitals. His contributions have been amazing, and to think that I had some small part in it is a real career highlight.

Program Spotlight:

Thoracic Aortic Surgery

Pauley Heart Center's multidisciplinary team offers a comprehensive, individualized approach to the diagnosis, monitoring, and medical and surgical management of patients with acute aortic conditions including aortic aneurysms, dissections, and other forms of thoracic aortic disease.

The discovery of aortic disease comes as a total surprise to many patients, as generally there are few, if any, warning symptoms. In fact, the vast majority of non-emergency aortic diseases are revealed through incidental imaging such as an echocardiogram, chest x-ray, CT scan or cancer workup.

"Although no patient likes to have a diagnostic procedure for one thing only to discover that he or she has another such as aortic disease, it certainly is better than the alternative of finding out through a life-threatening emergency such as an aortic aneurysm rupture or dissection," said Derek Brinster, MD, director of Pauley Heart Center's Thoracic Aortic Surgery Program.

An aortic rupture occurs when an aneurysm, or abnormal bulge in the wall of the aorta breaks, causing life-threatening internal bleeding. An aortic dissection is a longitudinal tear of the inner layer of the aortic wall, allowing blood to leak into the wall itself and cause separation of the inner and outer layers.

"About 80 percent of the Thoracic Aortic Surgery Program's patients are non-emergencies, that is they have suspected or confirmed aortic disease of some type. The remaining 20 percent are emergency surgeries, the majority of whom come through our emergency department or from referring cardiologists and hospitals that have established referring patterns or have heard about our program."

"Our program is set up not only to treat aortic disease surgically, but as a medical disease management program so that we can provide excellent care across the disease repertoire. That includes the full array of diagnostic services, as well as a personalized care strategy that may include medical therapy, lifestyle modifications, ongoing monitoring and elective surgical treatments, to the other end of the spectrum, accepting the sickest of the patients who have had an aortic catastrophe," said Dr. Brinster. "We have a large population of patients that we follow closely, often working in conjunction with their primary care physician to ensure that they are as safe as possible."

The program has grown significantly since 2003 when Dr. Brinster was recruited to the Division of Cardiothoracic Surgery to develop and build a program specific to serious aortic conditions. Aortic surgery work alone has undergone a five-fold increase. He credits the program's success to the fact that Central Virginia had a considerable need for a center dedicated to the aortic disease process, and to the multi-disciplinary team and sophisticated facilities VCU Medical Center provides.

"As a tertiary/quaternary care center, we have great expertise around the clock, not just in terms of surgeons and cardiologists, but also intensivists, radiologists, cardiac anesthetists, critical care staff and nursing support, as well as a dedicated cardiac surgery intensive care unit," he said. "We have gained a regional and national presence as referring physicians have become more and more familiar with our program and our desire to have complex patients brought here. We never say no and we have a fast patient transfer process."

Dr. Brinster sees continuing expansion of the program's work on ascending aorta and aortic reconstruction, aortic arch, descending thoracic aorta, and thoracoabdominal comprising the thorax and abdominal. In addition, he thinks that minimally invasive endovascular approaches will continue to be developed, refined and expanded for use in even some of the more complex surgical repairs.

"Some aortic programs box themselves into doing either open or minimally invasive techniques. We think that it is very important that our program is expert at both so that we can select what is best for the individual patient, never sacrificing patient care because of limitations on what we can do. Our goal always is to give each patient the best treatment for his or her unique needs."

Dr. Brinster earned his medical degree from the University of Pennsylvania School of Medicine. He did his specialty training at Brigham and Women's Hospital, Harvard Medical School, Arizona Heart Institute and the Hospital of the University of Pennsylvania. His clinical specialties include aortic root surgery, aortic root valve sparing procedures, thoracic aortic aneurysm and dissection surgery, endovascular treatment of the thoracic aorta and minimally invasive valve surgery.

Dr. Brinster decided to pursue a career in cardiothoracic surgery early on in his general surgery training.

"In my first year of general surgery training I started out on the CT floor as an intern," said Dr. Brinster. "I found it to be extremely technically challenging, frequently very rewarding and very humbling at the same time, and I liked the complexity of the operations."

PCI, from treatment idea to ideal treatment in 33 years

According to the American Heart Association, well over 1 million percutaneous coronary interventions (PCI, also known as balloon angioplasty and coronary angioplasty) procedures are performed in the United States annually.

Mike Cowley's career has tracked interventional cardiology from its days as a fledgling technology to what is now one of the most dynamic specialties in medicine. Having known many of the major players personally, and blessed with a mind that recalls names, dates and events in exacting detail, he brings the fascinating history of his specialty to life for lucky listeners. His prescient sense of the value of historical data led him to early participation in the National Heart, Lung and Blood Institute's PTCA Registry, which was pivotal in the development of interventional cardiology and set the stage for randomized trials.

Turn back the clock to September 1977. In Zurich, Switzerland, a young German physician, Dr. Andreas Gruentzig, performed the first coronary angioplasty on an awake human. That same year, Michael Cowley, MD, joined the MCV Division of Cardiology. He and another young cardiologist, George Vetrovec, MD, (who had joined the faculty a year earlier), were fascinated with Dr. Gruentzig's new technique and its possibilities for treating coronary artery disease.

"This was pretty exciting stuff," said Dr. Cowley. "Until then, catheter work was basically just diagnostic, used to identify a problem or evaluate its severity. If it was going to be corrected, it was done surgically. There was no therapy as far as catheters were concerned, so there was no such thing as interventional cardiology."

Anxious to learn more about the revolutionary technique, in December 1978 Cowley arranged to train one-on-one with Dr. Greuntzig in Zurich. Several months later, he and Dr. Vetrovec attended Dr. Greuntzig's first large course dedicated to coronary angioplasty.

By July 1979, MCV had opened a new, dedicated Cardiac Catheterization Laboratory and performed its first coronary angioplasty. It was one of the first 10 centers in the U.S. to use the new technique.

During the 1980s, a number of new interventional devices, such as steerable guide wires, coronary atherectomy devices to break up and remove plaque, and stents to prop open arteries, were invented and refined.

Pauley Heart Center's cath lab team members played key roles in the research, development and knowledge transfer of these and many other interventional heart cath procedures, devices and treatment protocols, and were frequently the first to bring them into clinical practice in the mid-Atlantic region.

"Percutaneous coronary interventions have come a very long way in a relatively short period of time," said Dr. Cowley. "And that is spite of the fact that meaningful advances don't come easy. You need a good idea, you need financial backing, you need to pick the right patients, and you need it to get the job done reliably, predictably and safely, and without requiring a super expert to do it."

"Being involved in interventional cardiology from its beginning and participating in its development has made for an exciting and gratifying career," said Cowley. "We have trained hundreds of cardiology and interventional cardiology fellows, and they have gone on to make their own important contributions to the field. But the highest satisfaction comes from what it has meant for patient care. Today there are millions upon millions of patients who have been successfully treated for coronary artery disease without having to have open heart surgery."

Door to Balloon: Every minute counts

Percutaneous Coronary Intervention in an emergency circumstance is termed a "primary PCI." It is the most common treatment for acute heart attack patients, with tens of thousands performed annually.

An acute heart attack is referred to as a STEMI, which is an acronym for ST segment elevation myocardial infarction. It is signaled by ST elevations on a 12-lead electrocardiogram, and it is an indicator that one of the heart's main arteries is blocked. When a coronary artery is blocked, the heart cannot receive the oxygen supply it needs from the blood, and that causes damage to the heart muscle. The longer the heart is deprived of oxygen, the more damage it sustains. For hearts, time is muscle.

To aid in reducing mortality rates from STEMI, and recognizing that primary PCI is the most effective method for opening the clogged artery and restoring blood flow of a STEMI patient's heart, the American College of Cardiology initiated D2B: An Alliance for Quality, a national program with the following goal: To achieve a door-to-balloon time of less than 90 minutes for at least 75 percent of non-transfer primary PCI (percutaneous coronary intervention) patients with ST-segment elevation myocardial infarction (STEMI) in all participating hospitals performing primary PCI.

VCU Medical Center joined the D2B Alliance as soon as it was established in 2006. At that time, our door-to-balloon mean time was 67 minutes, and the <90 minute goal was being achieved 100 percent of the time. Determined to improve that already excellent record, the VCU Emergency Department and Pauley Heart Center worked together to optimize our Door-to-Balloon program. Every aspect of the program was examined and new strategies were developed to maximize speed, efficiency and safety.

Analysis of a recent seven-month period reveals that VCU Medical Center's strategies are working exceptionally well, far surpassing the D2B Alliance's 75percent/<90 minute goal. Average D2B time has been reduced to 57 minutes, and even in off hours (weekends and nights from 7PM to 7AM), an average time of 59 minutes was achieved. Fastest times were 10 minutes and 18 minutes, both on weekends and both facilitated by an Emergency Medical Services pre-hospital ECG that mobilized the cath team while the patients were still in route to the Emergency Department.

Pauley Heart Center Patient Success Stories:

Getting to be 18 and 80

The Heart of an Athlete

Mikala Weston was 9 years old when her new pediatrician, Dr. Barbara Kahler, detected a heart murmur during a routine physical. Dr. Kahler referred Mikala to William Moskowitz, MD, Chair of the Division of Pediatric Cardiology at Pauley Heart Center.

"Mikala had never had any noticeable symptoms of a heart problem and, until then, no one had noticed that she had a heart murmur. And I had talked to people before who had heart murmurs and they didn't make them sound that serious, so we weren't terrible concerned," said Mikala's mother, Sheila Weston. "But of course we made an appointment right away with Dr. Moskowitz, and I am very glad we did." An ultrasound of Mikala's heart revealed a moderately large (16 mm) atrial septal defect (ASD).

"Dr. Moskowitz explained that Mikala had a hole in the septum—that is the wall that separates the heart's left and right sides—and that it needed to be fixed. He was very caring and reassuring, and as you can see, everything worked out just fine."

Things did indeed work out fine. Using a minimally invasive transcatheter technique, Dr. Moskowitz placed and secured an ASD device over the defect. Mikala was able to go home the next day and resume her normal activities within a few months.

"It seems like before the surgery I got tired a little quicker than the other kids," said Mikala. "But after the surgery I had more energy, could keep up with the others. That is when I got really interested in athletics."

Mikala's involvement with athletics has included both indoor and outdoor track and field, as well as girl's field hockey. As a junior at Highland Springs High School she was voted team captain of the field hockey team, and was named to the First Team, All District, and Honorable Mention, All Region/All Academic.

She graduated high school in June with a 4.45 GPS and is headed to the University of Virginia to study biomedical engineering on a full ride of scholarships.

"We are so grateful to Dr. Moskowitz. From the first time we saw him and at every follow-up visit he has been the same. He is always kind, explains things so that you can understand them, and is genuinely interested in what Mikala is doing, how things are going in school, what her plans are. He is one of the nicest, most caring doctors that I have ever met. Because of his good care, Mikala has had a childhood that she might not have had, and has an exciting future ahead of her."

No Time for Faulty Wiring

In 2007, a sleep study revealed that retired Air Force Colonel Donald Frew had heart rhythm abnormalities. After further testing, his Williamsburg, VA cardiologist, Dr. Keith Hanger, confirmed that he had atrial fibrillation (AFib or AF) and put him on medications to control the arrhythmia.

A self-proclaimed Energizer Bunny,® the then 77-year-old was determined not to let AFib slow him down. It was with great reluctance that he gave up two of his favorite pastimes, skiing and kayaking.

Atrial fibrillation is the most common abnormal rhythm of the heart. In AFib, the regular electrical currents that travel through the heart and cause the muscle of the heart to contract are irregular and rapid and, as a result, the heart beats irregularly and, usually, rapidly.

"The meds did a pretty good job at first, but periodically I would have episodes and the only way I could get relief was to lay down and try to sleep," said Col. Frew. "I'm not much of a napper but, believe me, when the old ticker starts jumping around in your chest, you'll do whatever it takes to get it to stop."

Col. Frew's episodes became increasingly frequent, and then in 2008, he had a Transcient Ischemic Attack (TIA), or small stroke. Strokes are not uncommon in AFib patients, in fact, about 15 percent of strokes occur in people with atrial fibrillation.

It was becoming clear that more aggressive AFib treatment approaches needed to be considered. Dr. Hanger referred Col. Frew to Dr. Ken Ellenbogen at Pauley Heart Center, and after tests and consultations, a catheter ablation procedure was scheduled.

Cardiac ablation is a complex procedure that involves threading a catheter through a vessel and into the heart, tracking down the areas that are causing the irregular heartbeat and destroying them. In patients with atrial fibrillation, these areas may be numerous, requiring specialized equipment to pinpoint and destroy the abnormal circuits.

"It went well. I felt great for about two weeks, and then, bam, the episodes returned," said Col. Frew. "So I got back in touch with Dr. Ellenbogen, I think it was on a Friday, and he said that, because of my age, a second ablation was not recommended. I was really disappointed. Then he called me back on Sunday, said he had done additional research and conferred with some other electrophysiology specialists, and to come on in and we'd talk about another ablation. That's the kind of doctor he is, always thinking about his patients, weekends included."

The second ablation was a complete success and at his 3-month checkup, Col. Frew's medications were reduced and he was taken off Coumadin.

"I am heading toward 81 years old and my life is pretty much back to normal, I have lots of projects going and who knows, maybe I'll even get my skis and kayak back. My wife and I are so appreciative of Dr. Ellenbogen and the whole staff at Pauley Heart Center. We've been in plenty of hospitals in our lives and we have never been so impressed with the overall experience. It's reassuring to see a department operating like a well-oiled machine with people where they are supposed to be when they are supposed to be there! To be cared for by people with compassion and a sense of humor was an added bonus."

Two Young Investigators, Two Grants, Too Many People to Thank

Antonio Abbate, MD, Assistant Professor of Medicine and Fadi N. Salloum, PhD, Assistant Professor of Medicine and Physiology & Biophysics have each been awarded Scientist Development Grants from the American Heart Association. Each of the four-year grants is valued at approximately $300,000. The prestigious, highly competitive grants are among the most sought-after by young investigators. According to the AHA National Center Research Committee, a total of 71 applications were funded out of 387 applications reviewed, resulting in an 18.35% success rate for applications to the Spring 2010 Scientist Development Grant program.

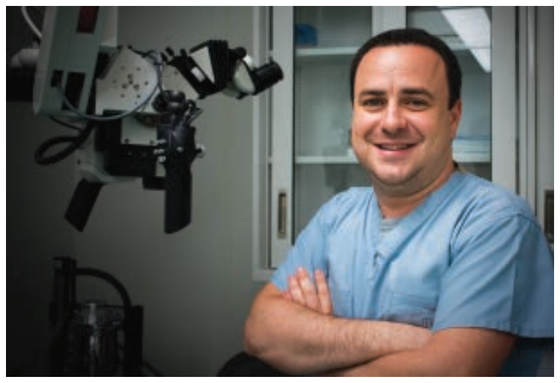
"It is quite an honor to receive this grant and I am grateful to my mentor, Dr. Rakesh Kukreja, my colleagues, and the support and excellent environment that the VCU Pauley Heart Center provides," said Dr. Salloum. "While each grant is evaluated primarily on the merits of the principal investigator and the research proposal itself, strong institutional support also is an essential element."

Fadi N. Salloum, PhD, *Assistant Professor of Medicine and Physiology & Biophysics*

Dr. Salloum's project is titled "H2S Signaling in Cardioprotection with Phosphodiesterase-5 Inhibitors." The study will examine whether a decline in the newly discovered gaseous transmitter, hydrogen sulfide (H2S), plays a role in the pathogenesis of heart failure, and, if so, can certain therapeutic agents, including tadalafil (Cialis) or gene transfer to overexpress a key enzyme modulate endogenous H2S generation and attenuate heart failure. Signaling pathways involving known cardioprotective enzymes will be examined systematically to shed light on the important role of H2S as a novel therapeutic target in the management of heart failure. Some of the preliminary data proposed in this grant have been published in *Circulation*, the official journal of the American Heart Association.

"Once you reach the maturity level to write a grant proposal, it takes at least one year to collect your data and do the writing," said Dr. Salloum. "That may not sound like such a long time but the reality is, you are working on this grant in some way from the day you started college. Your ideas may change, but your training and track record are what they are, and they signal your potential. So the award committee looks very hard at your CV."

In commenting on Dr. Salloum's grant application, the review committee wrote: "The investigator is very well trained and well suited to carry out this work. He has personally performed most if not all of the experimental techniques listed and successfully completed multiple previous studies using most of these techniques leading to publications in respected peer reviewed journals. He has been quite productive during his early career under his mentor. The investigator is the major strength of this proposal."



Antonio Abbate, MD, *Assistant Professor of Medicine*

Dr. Abbate's project expands on a pilot study he completed in 2009 titled "Virginia Commonwealth University Anakinra Remodeling Trial (VCU-ART)," the results of which were recently published in the *American Journal of Cardiology*. The newly funded project, "Interleukin-1 Blockade in Acute Myocardial Infarction" (or VCU-ART2) will be a randomized clinical trial to examine the effects of anakinra, an interleukin-1 antagonist, on cardiac remodeling after anterior myocardial infarction in 30 patients. The endpoints will include the evaluation of cardiac systolic and diastolic function, inflammatory biomarkers and leukocyte responsiveness.

"Getting this grant is great news. I am so excited to have funding to pursue this research focus, to build on what we found out in the VCU-ART pilot study, and to continue to search for novel therapeutic strategies to limit or prevent heart failure after AMI," said Dr. Abbate.

"But a grant is even more than that," he continued. "The reason that Fadi and I got these AHA grants is not simply because we had good ideas and good data. The award committee looks at so much more—the track record of your publications, how people that are your seniors view you, who are your mentors, do you have the facilities and will you make the best use of them, is your institution supportive of you, how well are you trained for this grant, are you the best person for the grant. The AHA is investing in you; they want you to be successful, they want to ensure the best possible return on the investment."

"It is a struggle for young investigators to get started. But we are fortunate here at VCU Pauley Heart Center. We are surrounded by people that encourage and trust in us—and Dr. George Vetrovec goes at the top of the list—and that give us the time, the money, and the space to work. We share this success with all of you."

News, Awards and Recognition

Rakesh C. Kukreja, PhD (above) was named by Governor Bob McDonnell as one of Virginia's Outstanding Scientists of 2010 for his research studying how male impotence drugs can help protect the heart or minimize damage following a heart attack.

Dr. Kukreja was named to membership in the NIH's new College of CSR Reviewers. He has also been appointed in the Editorial Board of *World Journal of Cardiology*.

Kenneth A. Ellenbogen, MD, Vineshwar Kasirajan MD, William B. Moskowitz, MD and **George W. Vetrovec, MD,** were named Top Docs in *Richmond Magazine*'s "Top Docs 2010." The magazine surveyed Richmond-area physicians, asking who they would recommend in a range of categories, and tallied the results to identify the top vote-getters.

Kapildeo Lotun, MD was selected as one of the top 25 Young Leadership applicants to serve as faculty at CRT 2010, which was held in February 2010 at the Omni Shoreham Hotel in Washington, DC. A special symposium with current leaders in the field was held for the Young Leadership Recognition Program participants.

Edward J. Lesfnesky, MD was awarded tenure in the Department of Medicine. Also, he has been named to the editorial board of the journal *Basic Research in Cardiology* and is a study section member of NIH-Aging Systems Gerontology, NIH-Myocardial Ischemia Metablolism, and VA Research Service-Cardiovascular A.

John Chau and **Brody Wehman**, medical students that worked in **Dr. Rakesh Kukreja's** research laboratory, received 2nd and 3rd place prizes for their presentations at VCU Honors Day.

Mona Shalwala, a Masters' student from the Department of Biochemistry and Molecular Biology that worked under the supervision of Dr. Kukreja, successfully defended her research thesis entitled "Role of SIRT1 in Sildenafil Induced Protection against Ischemia/Reperfusion Injury in Mice."

Fadi Salloum, PhD and **Rakesh Kukreja, PhD** edited a chapter, "Role of Sildenafil (Viagra™) in Cardioprotection and Treatment of Heart Failure" in *Adaptation Biology and Medicine, Volume 6: Cell Adaptations and Challenges*, edited by P. Wang, C.-H. Kuo, N. Takeda and P. K. Singal, Narosa Publishing House Ltd. 2010.

Antonio Abbate, MD presented "AAT Protects from Acute Myocardial Ischemia-Reperfusion Injury" at the 8th World Congress on Trauma, Shock, Inflammation and Sepsis in Munich, Germany in March 2010.

Dr. Michael Cowley received the Society for Cardiac Catheterization and Interventions' highest honor, the F. Mason Sones Distinguished Service Award, for the member who has made major contributions to the Society. Dr. Cowley, a past president of the Society, was recognized for his significant contributions to the development of the Society's Educational Programs in alliance with multiple industry partners. The programs have been a great success in advancing the Society's recognition among the interventional cardiology community and have provided an important educational venue for the introduction of new therapies.

George W. Vetrovec, MD served on the International Scientific Committee of the 8th International Congress on Coronary Artery Disease (ICCAD), October 2009 in Prague, Czech Republic.

Renowned physician-scientist, **Charles Dinarello, MD,** visited VCU Medical Center on June 9, 2010 to speak at a special Internal Medicine Grand Rounds titled "Interleukin-1 and the Auto-Inflammatory Diseases." The visit was sponsored by Pauley Heart Center. Dr. Dinarello has been mentoring and guiding Pauley Heart Center researcher Antonio Abbate, MD, in his investigation into the effects of Interleukin-1 blockade with the anti-inflammatory drug anakinra on heart remodeling after acute myocardial infarction.

Kenneth A. Ellenbogen, MD has been named Editor-in-Chief of a new online web portal, AFibprofessional.org. The site, a collaboration of the American College of Cardiology and the Heart Rhythm Society, has been developed to elevate the public's awareness of atrial fibrillation, educate patients and caregivers and ensure optimal care for cardiovascular patients.

On Topaz, MD led a team of researchers at Pauley Heart Center and the McGuire V.A. Medical Center investigating the clinical applications and basic research pertaining to laser-tissue interaction in the cardiovascular system, focusing on how lasers could be used to facilitate angioplasty. The study was published in the November issue of the journal, *Lasers in Medical Science*.

Stefano Toldo, PhD, (above) research associate, is one of five finalists for the European Society of Cardiology 2010 Young Investigator Award. He will do an oral presentation of his abstract, "Inflammasome formation in the mouse heart during acute myocardial infarction promotes adverse cardiac remodeling," at the ESC 2010 Congress in Stockholm, Sweden in late August. A panel of international experts judges the highly competitive and very prestigious award. Finalists are graded on originality, scientific content, presentation and answers to questions. A prize of 1500 Euros is awarded to the winner.

Cardiac Nursing News

Laura Savage RN, MSN, PCCN presented the "Cardiac Content for PCCN Certification Review Course" and "Navigating NTI" at the Greater Richmond Chapter of the American Academy of Critical Care Nurses in April 2010. She also did a poster presentation for Odyssey titled "Creative Strategies for Patient Education: Preparing Ventricular Assist Patients for Discharge" in March 2010 and presented "Caring for Your Heart" to the Liver Transplant Support Group in Richmond in February 2010.

She also has two recent publications:

Savage, L. Joyce, K., Jones, J. Developing and Maintaining Competency with Circulatory Assist Devices. Progress in Transplantation. 2010 June, Vol 20, No. 2, 1-4.

Stacy, KM., Helms, SV, Leary, SE. Peller, E., Savage, L (expert panel reviewers) for American Association of Critical Care –Core Curriculum for Progressive Care Nurses. Saunders Elsevier, 2010.

Michael Thibault, RN, MBA has joined Pauley Heart Center as Program Manager, Heart Failure/Heart Transplant. He was previously Director of Organ Procurement for LifeQuest Organ Recovery Services in Gainesville, Florida. He earned his BS in Nursing from the University of Florida College of Nursing and his MBA from the UF Warrington College of Business. Mr. Thibault has served extensively on professional organization committees and councils. He currently is Chairman of the UNOS Transplant Coordinator Committee.

Wanda Miller, (above) Pauley Heart Center Nursing Director, received a Doctor of Nursing Practice degree, with a focus in Executive Leadership and Education, from Waynesburg University in Waynesburg, PA in December 2009. She was certified in Executive Nursing Practice by the American Organization of Nurse Executives in February 2010.

2009 Dr. Carolyn McCue Award for Woman Cardiologist of the Year goes to Elizabeth G. Nabel, MD

Elizabeth G. Nabel, MD, a nationally recognized physician-scientist and leading advocate of cardiovascular research, has been selected to receive the second annual Dr. Carolyn McCue Woman Cardiologist of the Year Award from the Virginia Commonwealth University Pauley Heart Center.

Dr. Nabel is the newly appointed president of Brigham and Women's Hospitals and a professor of medicine at Harvard Medical School. Prior to joining BWH in January 2010, she was director of the National Heart, Lung and Blood Institute, the largest of the National Institutes of Health institutes, where she oversaw a staff of 850 and an annual budget of $3 billion.

Dr. Nabel had a full day of activities during her visit to VCU Pauley Heart Center on April 8, 2010. She began by speaking at the Cardiology Cath Conference on "Unusual Presentation of Premature CAD in a Teenager."

A very well attended Medical Grand Rounds followed, where Dr. Nabel presented "Genomic Medicine: Insights from a Premature Aging Syndrome." Prior to her talk she was given the 2009 Dr. Carolyn McCue Award for Woman Cardiologist of the Year Award by Dr. Michael Rao, President of Virginia Commonwealth University.

After Grand Rounds, Dr. Nabel, Dr. and Mrs. Rao, and woman healthcare leaders from VCU and the extended community attended a luncheon hosted by Dr. George Vetrovec. The informal discussion centered on the professional challenges and opportunities for women in today's healthcare environment.

Dr. Nabel's visit concluded with Pauley Heart Center's annual Cardiology Consortium dinner. With an audience of over 90 guests, Dr. Nabel presented a thought-provoking topic, "Discovery, healing, teaching: Will health care reform support or jeopardize these missions?"

The McCue Award honors the memory of Dr. Carolyn McCue, one of the few female cardiologists of her time and a pioneer in the field of pediatric cardiology, who practiced at the Medical College of Virginia, now the VCU Medical Center, for 42 years. She created and chaired the school's Pediatric Cardiology Division for 20 years, during which she was instrumental in establishing pediatric cardiology clinics in medically underserved communities throughout Virginia. The award, which carries a $10,000 prize, is made possible by a grant from the McCue family to encourage and inspire other young women to pursue careers in cardiology.

The 2009 Award Panel members included:

George A. Beller, MD, *University of Virginia*
Robert O. Bonow, MD, *Northwestern University*
Anne B. Curtis, MD, *University of South Florida*
Pamela S. Douglas, MD, *Duke University*
William C. Little, MD, *Wake Forest University*
Mary Ann Peberdy, MD, *VCU Medical Center*
Kiran B. Sagar, MD, *University of Wisconsin*
George W. Vetrovec, MD, *VCU Medical Center*
Kim Allen Williams, MD, *University of Chicago*

DR. CAROLYN MCCUE AWARD FOR WOMAN CARDIOLOGIST OF THE YEAR
2010

The 2010 Dr. Carolyn McCue Woman Cardiologist of the Year Award program is underway. The winner will be announced in late October, and an award ceremony and other related activities will take place in February 2011.

Publications

VCU Pauley Heart Center physicians, scientists and nurses authored or co-authored more than 65 articles or abstracts that were published in national journals from September 2009 to May 2010.

VCU faculty, fellows, staff and students are in red.

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Am J Emerg Med. 2009 Sep;27(7):779-84.

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Cardiac regenerative potential of adipose tissue-derived stem cells.
Acta Physiol Hung. 2009 Sep;96(3):251-65.

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J Pharmacol Exp Ther. 2009 Sep;330(3):884-91.

Lee HG, Chen Q, Wolfram JA, Richardson SL, Liner A, Siedlak SL, Zhu X, Ziats NP, Fujioka H, Felsher DW, Castellani RJ, Valencik ML, McDonald JA, Hoit BD, **Lesnefsky EJ,** Smith MA.
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PLoS One. 2009 Sep 25;4(9):e7172.

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Phosphodiesterase-5 inhibitor, tadalafil, protects against myocardial ischemia/reperfusion through protein-kinase g-dependent generation of hydrogen sulfide.
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Curr Treat Options Cardiovasc Med. 2009 Oct;11(5):349-59.

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Minisi AJ, Quinn MS, Jeong H.
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Eur J Heart Fail. 2010 Apr;12(4):319-22.

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National and International Meetings

VCU Pauley Heart Center was well-represented in the U.S. and abroad over the past nine months, including the annual American College of Cardiology Annual Scientific Sessions, the Heart Rhythm Society Annual Conference and others.

VCU faculty, fellows, staff and students are in red.

American Heart Association
November 15 – 18, 2009
Orlando, Florida

Detecting ICD Lead Failure
Kenneth A. Ellenbogen, Presenter

Late-Breaking Clinical Science
Kenneth A. Ellenbogen, Discussant

Abstract Oral and Poster Sessions

Oxygen Transport in Post Cardiac Arrest Syndrome with Goal Directed Hemodynamic Optimization
Benjamin Leong
Nathan White
Mohamad Tiba
William Holbert
Gerard Draucker
Juliana Medina
Mary A. Peberdy
Joseph P. Ornato
Kevin Ward

A Building Block Strategy for Optimizing Outcomes From Out of Hospital Cardiac Arrest
Joseph P. Ornato
Mary Ann Peberdy
Michael C. Kurz

Prevalence of Troponin Elevations in Patients with Cardiac Arrest: Implications for Assessing Quality of Care in Hypothermia Centers
Michael C. Kontos
Mary Ann Peberdy
Joseph P. Ornato
Michael C. Kurz,
Charlotte S. Roberts
Michelle Gossip
Harinder S. Dhindsa
Renee D. Reid

Chronic Dietary Supplementation of Nitrate Prevents Doxorubicin-Induced Cardiac Mitochondrial Damage
Qun Chen
Shu-Guang Zhu
Edward J. Lesnefsky
Rakesh C. Kukreja
Lei Xi

Chronic PDE5-Inhibition With Sildenafil Improves Diastolic Function and Clinical Status in Patients with Stable HF
Marco Guazzi
Ross Arena
Maurizio D Guazzi

P2X7 Inhibition: A Novel Strategy to Prevent Adverse Cardiac Remodeling Following AMI
Benjamin W. Van Tassell
Lisa Smithson
Angela C. Menna
Jessica Harrington
Amit Varma
Ignacio M. Seropian
Stefano Toldo
Antonio Abbate

Time Course, Mechanisms and Management of Recurrent Atrial Arrhythmias Following the "Mini-Maze" Procedure
Jordana Kron
Vigneshwar Kasirajan
Mark A. Wood
Marcin Kowalski
Frederick T. Han
Kenneth A. Ellenbogen

Comparison of Arrhythmia Discrimination by Subcutaneous versus Dual Chamber Transvenous ICD Systems: Primary Results From START
Michael R. Gold
Dominic A. Theuns
Bradley P. Knight
Lacy J. Sturdivant,
Kenneth A. Ellenbogen
Mark A. Wood
Martin C. Burke

Using Decision Analysis to Determine the Benefit of Primary Prevention Implantable Cardioverter-defibrillators in Elderly Patients
Mitesh S. Amin
Mark A. Wood
Kenneth A Ellenbogen

Prognostic Characteristics of Heart Rate Recovery According to Sex in Patients with Heart Failure
Ross Arena
Jonathan Myers
Mary Ann Peberdy
Daniel Bensimhon,
Paul Chase
Sherry Pinkstaff
Marco Guazzi,

Percent-Predicted Oxygen Uptake Efficiency Slope Prognostically Outperforms the Actual Value in Patients With Heart Failure
Ross Arena
Jonathan Myers
Mary Ann Peberdy
Daniel Bensimhon,
Paul Chase
Sherry Pinkstaff
Marco Guazzi

PI3Kgamma Inhibition Prevents Adverse Cardiac Remodeling after Acute Myocardial Infarction in the Mouse
Benjamin W Van Tassell
Ignacio M. Seropian
Jessica Harrington
Lisa Smithson
Stefano Toldo
Angela C. Menna
Andrew W. Scharf
Roshanak Robati
Antonio Abbate

Percutaneous Revascularization versus Medical Therapy Alone to Treat Renal Artery Stenosis: A Meta-Analysis
Ranjith Shetty
Antonio Abbate
Giuseppe Biondi Zoccai

miR-21 Promotes Cardiomyocyte Regeneration in Ischemic Mouse Heart by Triggering Stem Cell Activation and Cardiomyocyte-Committed Differentiation
Chang Yin
Fadi N. Salloum
Nicholas N. Hoke
Vinh Q. Chau
Rakesh C. Kukreja

Chronic Daily Therapy with Tadalafil Improves Multiple Cardiovascular Risk Factors in Obese, Diabetic Mice
Amit Varma
Fadi N. Salloum
Nicholas N. Hoke
Rakesh Kukreja

Development of a Cardiopulmonary Exercise Prognostic Score for Optimising Risk Stratification in Heart Failure: The (P)e(R)i(O)dic (B)reathing during (E)xercise (PROBE) Study
Marco Guazzi
Patrizia Boracchi
Ross Arena
Jonathan Myers
Mary Ann Peberdy
Daniel Bensimhon
Paul Chase
Giuseppe Reina

Cardiac Contractility Modulation Improves Exercise Tolerance in NYHA Class III Patients with Narrow QRS and EF Between 25 and 35%: A Subgroup Analysis of the FIX-HF-5 Study
Alan H. Kadish
Koonlawee Nademanee
Kent Volosin
Steven Krueger
Suresh Neelagaru
Nirav Raval
Stanislav Weiner
Marc Wish
Peter Carson
Kenneth Ellenbogen
Robert Bourge
Michael Parides
Richard Chiacchierini
Rochelle Goldsmith
Sidney Goldstein
Yuval Mika
Daniel Burkhoff
William Abraham

Statins Improve the Long-Term Clinical Outcomes of Patients with Thoracic Aortic Aneurysms
Ion S. Jovin
Mona Duggal
Keita Ebisu
Hyung Paek
Adriana D. Oprea
Maryann D. Tranquilli
John Rizzo
Redin Memet
Marina Feldman
James Dziura
Cynthia Brandt
John A. Elefteriades

Gender Disparity in Renal Angiography for Hypertensive Patients in the United States
Mitesh S. Amin
Ranjith Shetty
Ion S. Jovin

Biomarker elevations late after myocardial infarction and association with health status
D. E. Lanfear
Michael C. Kontos
F. Tang
S. L. Daugherty
P. G. Jones
J. A. Spertus

American College of Cardiology Annual Scientific Session and i2 Summit
Atlanta, Georgia
March 14 – 16, 2010

i2 Poster
George W. Vetrovec, Discussant
i2 Poster
Michael J. Cowley, Discussant
MOC Faculty
Michael J. Cowley
ACC Poster
Kenneth A. Ellenbogen, Discussant
ACC Poster
Robert L. Jesse, Discussant
i2 Meet the Experts
George W. Vetrovec, Co-Chair
Joseph P. Ornato, Panelist
Kenneth A. Ellenbogen, Panelist

Interleukin-1 Blockade Ameliorates Left Ventricular Remodeling Following St-segment Elevation Acute Myocardial Infarction - The VCU-ART Pilot Study
Antonio Abbate
Michael C. Kontos
John Grizzard
Giuseppe GL Biondi-Zoccai
Benjamin W. Van Tassell
Roshanak Robati
Ross Arena
Charlotte Roberts
Amit Varma
Christopher Gelwix
Fadi N. Salloum
Andrea Hastillo
Charles A. Dinarello
George W. Vetrovec

Interleukin-1_ Neutralization Ameliorates Post-infarction Cardiac Remodeling in the Mouse
Antonio Abbate
Benjamin W. Van Tassell
Ignacio M. Seropian
Stefano Toldo
Fadi N. Salloum
Amit Varma
Charles A. Dinarello

Cardioprotective Effects of _1-Antitrypsin in Experimental Acute Myocardial Infarction Due to Transient Ischemia in the Mouse
Antonio Abbate
Benjamin W. Van Tassell
Ignacio M. Seropian
Stefano Toldo
isa Smithson
Charles A. Dinarello

Comparison of the Prognostic Value of Peak CK-MB and Troponin Levels among Patients with Acute Myocardial Infarction
Chee Tang Chin
Tracy Y. Wang
Shuang Li
Eric D. Peterson
Stephen D. Wiviott
James A. deLemos
Michael C. Kontos
Matthew T. Roe

Evidence for and against Resynchronization in Patients with a Narrow QRS Complex
Kenneth A. Ellenbogen

New or Presumed New Left Bundle Branch Block in Patients with Acute Myocardial Infarction: Findings from ACTION Registry-GWTG
Khung Keong Yeo
Shuang Li
Tracy Y. Wang
Deepak L. Bhatt
Jorge Saucedo
Michael C. Kontos
Matthew T. Roe
William J. French

Predictive Value of Ejection Fraction and Renal Function in High Risk Acute Coronary Syndrome Patients: Results from the SYNERGY Trial
Melvin R. Echols
Michael C. Kontos
Kristi Prather
Douglas D. Schocken
Stuart D. Russell
Judith S. Hochman
Luigi Biasucc
John French
Kenneth Mahaffey

Experimental Biology
American Physiological Society
April 24 – 28, 2010
Anaheim, California

BAY 58-2667, a Novel NO-Independent Activator of Soluble Guanylate Cyclase, Protects against Ischemia/Reperfusion Injury: Potential Role of Hydrogen Sulfide Signaling.
Fadi N. Salloum
Anindita Das
Vin Q. Chau
Nicholas N. Hoke
Ramzi Ockaili
Stasch Johannes-Peter
Rakesh Kukreja

Phosphodiesterase-5 Inhibition with Tadalafil Attenuates Left Ventricular Dysfunction and Cardiomyocyte Apoptosis in Doxorubicin-induced Cardiotoxicity in Mice
Sai Sudha Koka
Anindita Das
Shu-Guang Zhu
David Durrant
Lei Xi
Rakesh Kukreja

Rapamycin (Sirolimus)–induced protection against ischemia/reperfusion injury is mediated through AMPK, Akt and JAK/STAT pathway in isolated mouse heart.
Anindita Das
Fadi N. Salloum
Lei Xi
Eric Mayton
S. K. Desai
Ramzi Ockaili
Rakesh Kukreja

Mitigation of Heart Failure Progression with Sildenafil Involves Inhibition of RhoA/Rho-Kinase Pathway.
Fadi N. Salloum
Vin Q. Chau
Nicholas N. Hoke
Antonio Abbate
Rakesh Kukreja

Adenoviral transfer of PKGI_ attenuates apoptosis and necrosis in adipose derived stem cells.
Nicholas N. Hoke
Fadi N. Salloum
Vin Q. Chau
Anindita Das
Paul B. Wehman
Rakesh Kukreja

SCAI 33rd Annual Scientific Sessions
San Diego, California
May 5-8, 2010

PV Intervention: State of the Art
Michael Cowley, Moderator
Maintenance of Certification
Michael Cowley, Moderator
Case Review: Great Saves
Evelyn Goudreau, Presenter

Heart Rhythm 2010
Denver, Colorado
May 12 – 15, 2010

Live Case Presentation
Experts Unplugged
Kenneth Ellenbogen, Invited Speaker

How to Avoid Complications with ICD/CRT Implantations: Clinical Pearls to Avoid the Common Complications
Kenneth Ellenbogen, Quality Commentator

Cyroablation for SVT-Novel Approaches to SVT ablation
Kenneth Ellenbogen, Presenter

Abstracts

Long-term Follow-up Results Of Minimally Invasive Surgical Ablation For Atrial Fibrillation (MISAA)
Frederick T. Han
Vigneshwar Kasirajan
Marcin Kowalski
Robert Kiser
Luke Wolfe
Mark A. Wood
Kenneth A. Ellenbogen

Multiple LV pacing configurations in Cardiac Resynchronization Therapy decrease the probability of Phrenic Nerve Stimulation
Jose F. Huizar
Karoly Kaszala
Kenneth A. Ellenbogen
Mark A. Wood

Posters

Does RV Anodal Stimulation Interfere with the Accuracy of LV Auto Threshold algorithms for determining LV Capture Thresholds?
Gautham Kalahasty
Rahul N. Doshi
John H. Lobban
Michael C. Giudici
Michael R. Gold
Steven Eddy
Aaron R. McCabe
Shibaji Shome
Kenneth A. Ellenbogen

Evaluation of a Unique LV Pacing Vector in Patients with Bipolar LV leads
Michael Gold
Gautham Kalahasty
John H. Lobban
Michael C. Giudici
Rahul N. Doshi
Amy Brisben
Anand Iyer
Aaron R. McCabe
Shibaji Shome
Kenneth A. Ellenbogen

Acute Clinical Performance of a New Left Ventricular AutoThreshold Algorithm
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Richard K. Shepard
John H. Lobban
Michael C. Giudici
Rahul N. Doshi
Peter Gallagher
Yanting Dong
Aaron R. McCabe
Shibaji Shome
Michael R. Gold
Kenneth A. Ellenbogen

The Left Ventricular Evoked Response Signal in Bipolar LV Pacing Leads with a Large Inter-electrode Spacing
John H. Lobban
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Rahul N. Doshi
Michael R. Gold
Amy Brisben
David Dawson
Julie Ecklund
Shibaji Shome
Kenneth A. Ellenbogen

Downloadable Software Reduces Inappropriate Shocks Caused by ICD Lead Fractures
Michael O. Sweeney
Kenneth A. Ellenbogen
Anthony S.L.Tang
David Whellan
Peter Mortensen
Lou Sherfesee
Brett Peterson

Acute Capture Detection Performance of a new Left Ventricular AutoThreshold Algorithm
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Shibaji Shome
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Different Strength-Duration Curves of Phrenic Nerve Stimulation between LV Pacing Configurations
Jose F. Huizar
Karoly Kaszala
Mark A. Wood
Kenneth A. Ellenbogen